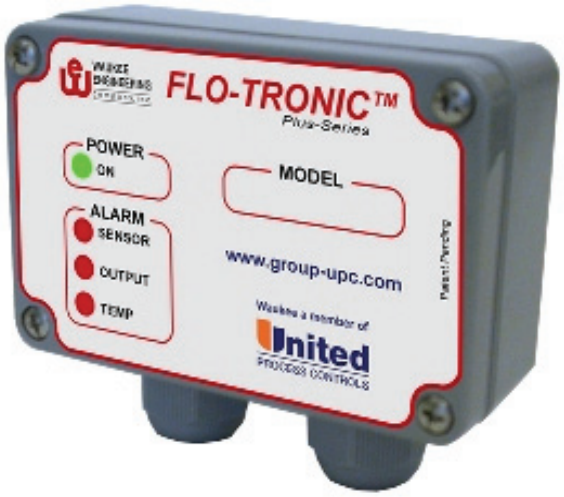
WAUKEE ENGINEERING company, inc.

WWW.GROUP-UPC.COM

Flo-Tronic Plus™

User Manual Revision 03



Manual #: 011
Initial Release: 12/21/2010

Rev No: 03
Date: 4/15/2013

COPYRIGHT

No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual, or otherwise, without prior written permission of United Process Controls Inc..

DISCLAIMER:

The Flo-Tronic Plus™ is to be used by the industrial operator under his/her direction. Waukee Engineering is not responsible or liable for any product, process, damage or injury incurred while using the Flo-Tronic Plus™. United Process Controls Inc. makes no representations or warranties with respect to the contents hereof and specifically disclaim any implied warranties or merchantability or fitness for any particular purpose.

For assistance please contact:

United Process Controls Inc.
TEL: +1-414-462-8200 • FAX: +1-414-462-7022
Toll free North America: +1-800-438-3347
waukee.support@group-upc.com
www.group-upc.com

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

1. WARNING

Thank you for purchasing control equipment from Waukee Engineering a member of United Process Controls. We want your new control equipment to operate safely. Anyone who uses this equipment should read this publication (and any other relevant publications) before installing or operating the equipment.

To minimize the risk of potential safety problems, you should follow all applicable local and national codes that regulate the installation and operation of your equipment. These codes vary from area to area and usually change with time. It is your responsibility to determine which codes should be followed, and to verify that the equipment, installation, and operation are in compliance with the latest version of these codes.

At a minimum, you should follow all applicable sections of the National Fire Code, National Electrical Code, and codes of the National Electrical Manufacture's Association (NEMA). There may be local regulatory or government offices that can also help determine which codes and standards are necessary for safe installation and operation.

Equipment damage or serious injury to personnel can result from failure to follow all applicable codes and standards. We do not guarantee the products described in this publication are suitable for your particular application, nor do we assume any responsibility for you product design, installation, or operation.

If you have any questions concerning the installation or operation of this equipment, or if you need additional information, please call us at 414-462-8200.

WARNING: Read this manual thoroughly before using Flo-Tronic.

WARNING: This unit contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures refer to an applicable ESD protection handbook.

WARNING: Flo-Meter must be earth grounded.
Ungrounded Flo-Meters may become a source of Ignition.

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

2. TABLE OF CONTENTS

1. WARNING 11

2. TABLE OF CONTENTS 12

3. MANUAL OVERVIEW 13

4. FLOW SENSOR INTRODUCTION 14

5. SPECIFICATIONS 15

6. INSTALLATION AND WIRING 16

7. CALIBRATION AND FIELD SERVICE 19

8. MAINTENANCE 21

9. CALCULATIONS 22

10. TROUBLESHOOTING 23

10. APPENDIX "A" - DRAWINGS 24

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

3. MANUAL OVERVIEW

The Purpose of this Manual

Thank You for Purchasing a Flo-Tronic Plus™ Flow Sensor. This manual shows you how to install, wire and maintain Waukee's Flo-Tronic Plus. It also helps you understand how to interface it to other devices in a control system. This manual contains important information and should be read and understood by all individuals who install, use or service this equipment.

Supplemental Manuals

The Installation and Operation of Waukee Flo-Meters manual contain technical information as well as precautions about Waukee Flo-Meters.

Technical Support

We strive to make our manuals the best in the industry. We rely on your feedback to let us know if we are reaching our goal. If you cannot find the solution to your particular application, or, if for any reason you need technical assistance, please call us at:

+1-414-462-8200 Toll free North America: +1-800-438-3347

Our technical support group will work with you to answer your questions. They are available Monday through Friday from 8:00 A.M. to 4:30 P.M. Central Standard Time. We also encourage you to visit our web site where you can find technical and non-technical information about our products and company.

http://www.waukeemeters.com
http://www.group-upc.com

If you have a comment, question or suggestion about any of our products, services, or manuals, please e-mail or contact us by phone.

Conventions Used

When you see the exclamation point icon in the left-hand margin, the paragraph to its immediate right will be a warning. This information could prevent injury, loss of property, or even death in extreme cases. Any warning in this manual should be regarded as critical information that should be read in its entirety. The word WARNING or CAUTION in boldface will mark the beginning of the text.

When you see the "notepad" icon in the left-hand margin, the paragraph to its immediate right will be a special note.

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

4. FLOW SENSOR INTRODUCTION

The Waukee Flo-Tronic™ utilizes a sensor to read the position of the float rod indicator on a Waukee Flo-Meter™. The unit provides both electrical and mechanical indication of flow. The unit is factory calibrated to provide linear and accurate flow measurement. If necessary, the Flo-Tronic may be "field calibrated".

How it works

Magnet assembly attached to float rod of the Waukee Flo-Meter interacts with a magnetostrictive linear position sensor installed in Flo-Meter sensing head. A strain pulse is induced in a specially designed waveguide by the momentary interaction of two magnetic fields. One field comes from a moving magnet, which passes along the outside of the sensing tube, the other field from a current pulse launched along a wire inside the waveguide. The interaction between these two magnetic fields produces a strain pulse which travels at sonic speed along the waveguide, until the pulse is detected at the head of the transducer. The position of the moving magnet is precisely determined by measuring the elapsed time between the launching of the electronic pulse and the arrival of the strain pulse. As a result, accurate non-contact sensing of the Flo-Meter's indicator is achieved. The indicator position is directly related to the Flo-Meter's flow rate and is represented by a proportional analog electrical signal.

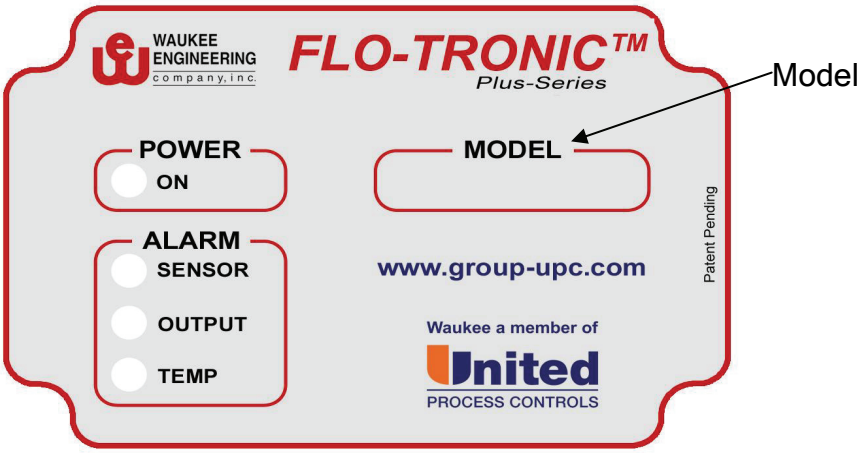
Model Explanation

FT M17

Size

S17: S Gas (3" Scale)
SF17: SF Liquid (3" Scale)
M17: M1-7 (6" Scale)
M811: M8-11 (6" Scale)

L13: L1-3 (9" Scale)
L46: L4-6 (9" Scale)
L79: L7-9 (9" Scale)
L10: L10 (9" Scale)



Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

5. SPECIFICATIONS

General Specifications		
Operation Specification		
Measurement	**Accuracy**	± 0.4% FS + 1.6% Rd
	Repeatability	< 0.5% FS
	Turndown Ratio	1:40 (2.5 ... 100%)
Electrical Power	**Operating Voltage**	24VDC ± 10%
	Power Consumption	75mA
Analog Output	**Ranges Selectable**	Current: 4-20mA or 0-20mA Voltage: 0-10VDC or 2-10VDC
	Voltage Output	
	Short Circuit Protection	YES
	Short Circuit Current	0.875mA
	Min Load Impedance	1k Ohm
	Current Output	
	Open Circuit Voltage	24VDC
	Max Load Impedance	500 Ohm
Relay Output	**Type**	SPST
	Contact Rating	0.5A @ 30VDC
	Alarm Logic	No power or alarm condition de-energize relay
Environment	**Operating Temp**	0°C to 65°C (32°F to 150°F)
	Humidity	20 to 90% RH (non-condensing)
	Storage Temp	-20°C to 65°C (-4°F to 150°F)
	Enclosure Rating	IP 65
	Installation Location	Keep from corrosive gas and liquid

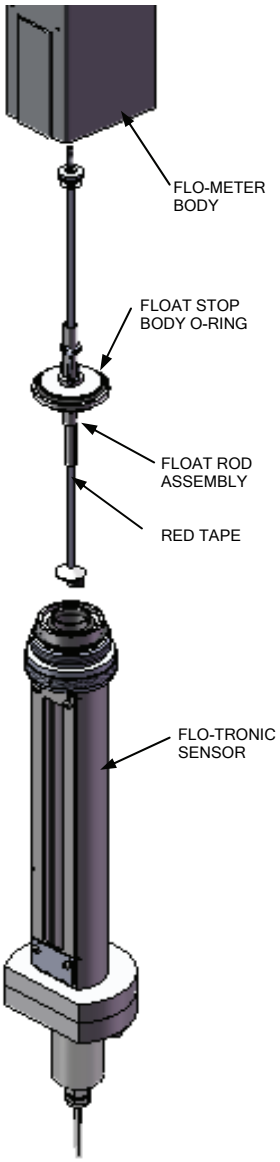
Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

6. INSTALLATION AND WIRING

Flo-Meter Installation

The Installation and Operation of Waukee Flo-Meters manual contains instructions on the proper installation of the Flo-Meter. Read all CAUTIONS and WARNINGS before proceeding.

The Flo-Tronic -Meter is shipped as a complete unit. Before installing the Flo-Meter, carefully remove the Flo-Tronic Sensor, to achieve this lay the unit on its side on a work bench or table. Then hold the Flo-Tronic unit with one hand, while unscrewing the union nut counters clockwise with the other hand to loosen it.



CAUTION: Once the Flo-Tronic is loose from the Flo-Meter make sure to pull the Flo-Tronic from the Flo-Meter straight back off the float rod assembly. Moving the Flo-Tronic to one side or another during removal may result in damage to the float rod assembly.

Remove the Float Rod Assembly and store it in a safe location until Flo-Meter body is installed and mounted. Once the Flo-Meter is installed, remove the red tape from the float rod and insert the float rod assembly into the Flo-Meter body. Fill the sight glass tube with Waukee Flo-Meter oil so that the level of oil is approximately one (1) inch from the top. Then carefully install the Flo-Tronic on to the Flo-Meter.

Do not put oil in the sight glass tube of meters used for **oxygen** or **methanol** service. Oxygen Flo-Meters should be run dry, or with distilled water. Flo-Meters for Methanol service will automatically fill the sight glass tube with Methanol when in service.

WARNING: Do not fill the sight glass tube with Flo-Meter oil on meters used for oxygen service. Use of oil may cause fire or explosion. Serious personal injury may result from fire or explosion.

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

Wiring Guidelines

Your company may have guidelines for wiring installation. If so, you should check those before you begin the installation. Here are some general things to consider:

- Use the shortest wiring route whenever possible.
- Use shielded wiring for all signal wiring and ground the shield at the Field Device end. DO NOT ground the shield at both the Flo-Tronic Sensor and Field Device.
- Do not run the signal wiring next to large motors, high current switches, or transformers. This may cause noise problems.
- Route the wiring through an approved cable housing to minimize the risk of accidental damage. Check local and national codes to choose the correct method for your application.
- Be sure to leave enough slack in the cables to allow easy removal of the Flo-Tronic from the Flo-Meter for maintenance. If seal tight or similar conduit is used, be sure to provide an adequate loop of conduit for maintenance access.

Wiring Connections

All wiring connections are located inside the main box. To access the wiring terminals remove the (4) four screws located on the front of the box and remove the cover.

CAUTION: To reduce the risk of electrical shock and also to prevent damage to the Flo-Tronic and the Field Device. It is advised to turn off the supply power to the Flo-Tronic and Field Device before connecting or disconnecting any wires.

WARNING: Any electrical or mechanical modification to this equipment without prior written consent of United Process Controls will void all warranties, may result in a safety hazard, and may void the CE listing.

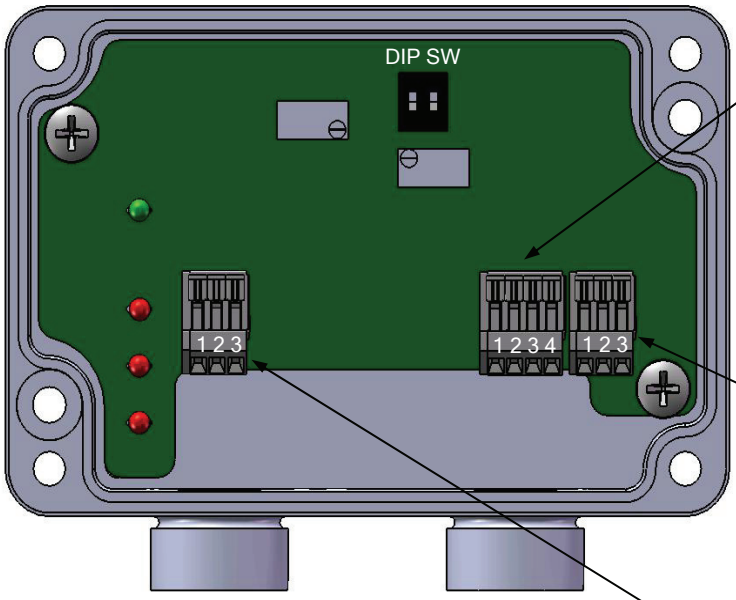
Use 18-22AWG shielded cable for the signal wiring. It is recommended to run all signal wires in a separate steel conduit. The shield wire should only be connected at the Field Device end. Do not connect shield wire on both ends.

Circuit Protection

The Flo-Tronic is equipped with built-in over-voltage and short circuit protection. The unit may require recycling of power to reset once the fault condition is removed.

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

Wiring Terminals



Power / Analog Output Wiring (4 Pin Terminal Block)		
Pin #	Description	Wire Color
1	+24VDC	Red
2	DC Common	Black
3	Analog Output (+)	Green
4	Analog Output (-)	White

Alarm Relay Wiring (3 Pin Terminal Block)		
Pin #	Description	Wire Color
1	Common	Brown
2	N.C.	Blue
3	N.O	Orange

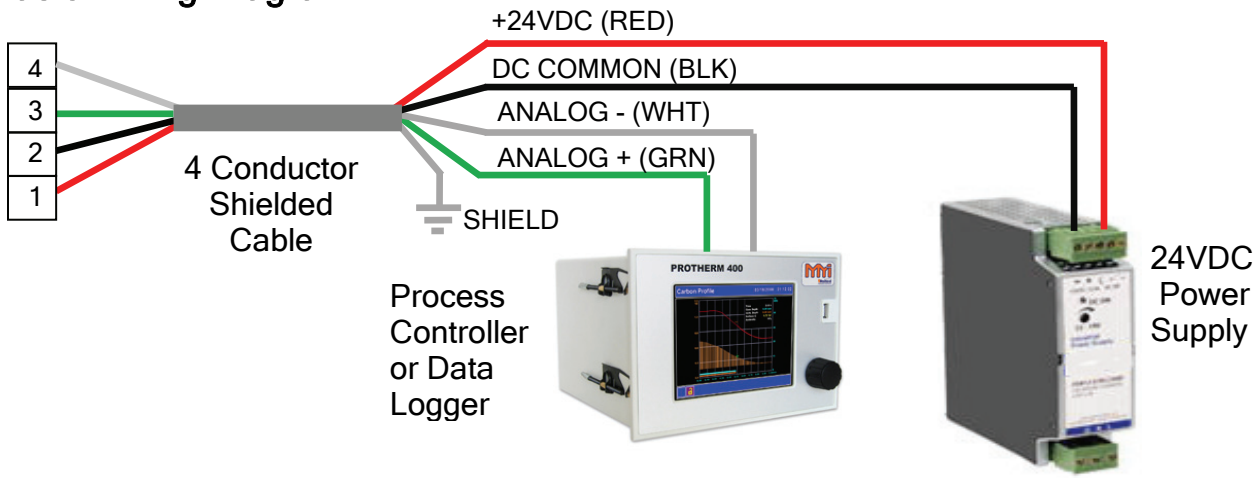
Sensor Wiring (3 Pin Terminal Block)		
Pin #	Description	Wire Color
1	+VDC	Brown
2	Signal Input	Green
3	Common	White

Analog Output Configuration

Use the table below to configure the unit to the desired analog output

DIP Switch Settings		
Switch A	Switch B	Analog Output
OFF	OFF	4-20mA
OFF	ON	2-10VDC
ON	OFF	0-20mA
ON	ON	0-10VDC

Basic Wiring Diagram



Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

Alarm Relay Wiring

The Flo-Tronic Plus includes an alarm relay, on power up the relay is energized to indicate that the unit has power. The relay will de-energize under the following alarm conditions:

- Loss of Power
- Loss of Sensor Signal
- Over Temperature Condition
- Output Wiring Problem

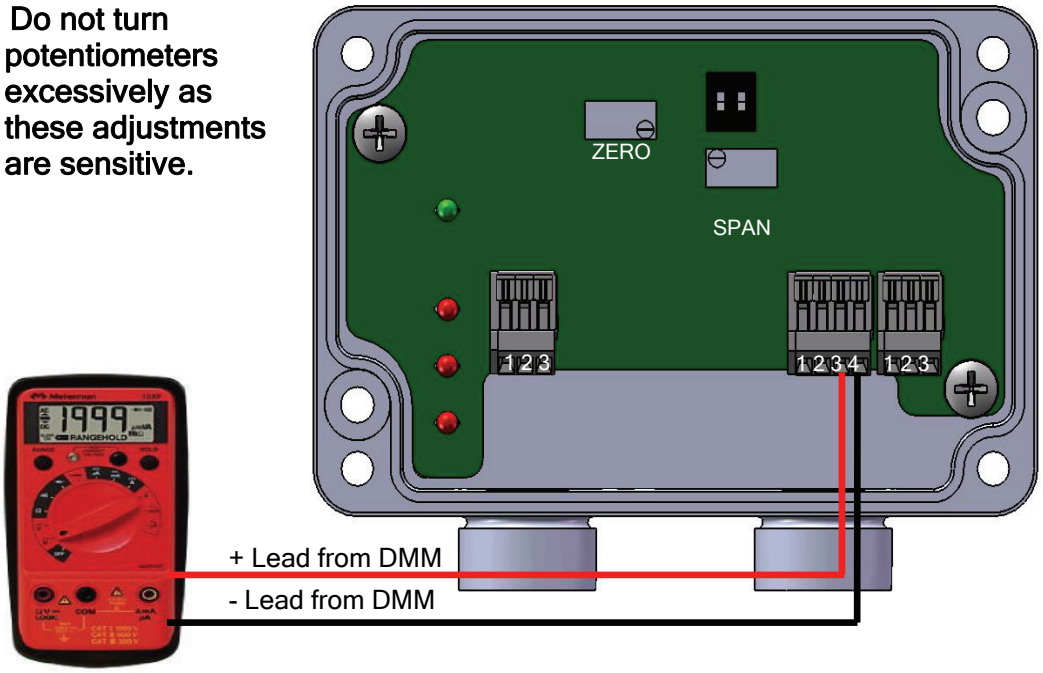
CAUTION: Relay is for use with 30VDC or less ONLY!!! Use of any other voltage may result in damage to unit and poses a potential fire risk.

WARNING: An external relay must be used if connecting alarm contacts to a load over 0.5 Amps. Use of alarm contact with loads over 0.5 Amps will result in relay failure and poses a potential risk of fire.

7. CALIBRATION AND FIELD SERVICE

The Flo-Tronic Plus output signal is calibrated at the factory and should be received calibrated, but in some cases the unit may require field calibration of the electronics. If you find that the analog output signal is not correct in relation to the indicated flow, you can recalibrate the output by the adjustment of the "Zero" and "Span" potentiometers located inside the sensor box.

CAUTION: Do not turn potentiometers excessively as these adjustments are sensitive.



Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

Measurement of Ouput Signal

The best way to measure the output signal is to disconnect the unit from the field device and connect a multi-meter across terminals 3&4. Set the multi-meter to measure the correct signal the unit is setup for.

If you are unsure what the output signal is, refer to “Analog output configuration” located on page 8.

Adjustment of Output Signal

This procedure requires the ability to move the float rod from 0 “Zero” flow to 100% “Full Scale” flow. There are two methods to achieve this.

Method 1

Remove the Flo-Tronic and float rod assembly from the Flo-Meter and manually move the float rod assembly to the required position for calibration. Refer to page 6 of this manual for removal and installation. This is the preferred method of Calibration of the Flo-Tronic.

CAUTION: Make sure supply fluid to Flo-Meter has been SHUT-OFF before removing the Flo-Tronic from the Flo-Meter. Failure to do so may result in accidental death or explosion.

Method 2

If the equipment and process allows this, the float rod assembly can be moved to the required position for calibration by shutting off the fluid valve for zero flow and opening the fluid valve to full open for full flow.

WARNING: Depleting or over-gassing of equipment that the Flo-Meter is connected to may produce a hazardous condition, check with all personnel before attempting this method of calibration. Waukee is not responsible for any damages that may occur using this method.

To adjust the Zero (0%), the float rod should be at the bottom or zero flow position. Then adjust the “Zero” pot until the signal is correct for the selected analog output. This will be 4mA for 4-20mA, 0mA for 0-20mA, 2V for 2-10VDC and 0V for 0-10VDC

To adjust the Span “Full Scale Flow”, the float rod will now need to be adjusted to Full scale (100%). Then adjust the “Span” pot until the signal is correct for the selected analog output. This will be 20mA for a current output or 10VDC for a voltage output.

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

8. MAINTENANCE

The Flo-Tronic is a magnetic based sensor which is unaffected by dirt. The dampening oil can be soiled to the point that it is not possible to visually read the flow on the Flo-Meter and the unit will still accurately determine the position of the float rod assembly.

The Flo-Meter is a mechanical device that requires regular maintenance in order to maintain accuracy. All Flow Meters are susceptible to dirt affecting its accuracy. Although not all manufactures have a means to gauge when the Flo-Meter requires maintenance. Waukee Flo-Meters on the other hand have a built in indication when the Flo-
Meter requires maintenance, which is the dampening oil. When the oil becomes soiled it is indication maintenance on the Flo-Meter is needed. The frequency of maintenance intervals will vary depending on the cleanliness of the gas being used. To replace the oil will require the removal of the Flo-Tronic; refer to the installation section of this manual for instructions. Also during these maintenance intervals it is recommended that all gaskets and o-rings are inspected for signs of wear or damage. Replace worn or damaged seals. Gasket kit sets are available from Waukee if needed.

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

9. CALCULATIONS

Determine output for a given flow rate

1. First determine the % of scale represented by:

$$\% \text{ of Scale} = \frac{\text{Actual Flow (cfh)}}{\text{Full Scale Flow (cfh)}}$$

2. Then the Output is calculated by:

For 4-20mA mA = (% of Scale x 16) + 4
For 0-20mA mA = % of Scale x 20
For 2-10VDC VDC = (% of Scale x 8) + 2
For 0-10VDC VDC = % of Scale x 10

Example 1:
Scale Plate is 750CFH
Indicated Flow is 500CFH
Output range = 4-20mA

$\frac{500}{750} = .6666$

(.6666 x 16)+4 = 14.65mA

Determine the flow rate from the output

1. First determine % of Full Scale:

$$\text{4-20mA Range} = \frac{\text{mA} - 4}{16}$$

$$\text{0-20mA Range} = \frac{\text{mA}}{20}$$

$$\text{0-10VDC Range} = \frac{\text{VDC}}{10}$$

$$\text{2-10VDC Range} = \frac{\text{VDC-2}}{8}$$

2. Then Actual Flow is calculated by:

Actual Flow = % of Full Scale x Full Scale Flow

Example 2:
Find the flow rate for a 4-20mA signal of 12.00mA and a Flow Meter Scale of 1000CFH

$\frac{12 - 4}{16} = .5$ or 50%

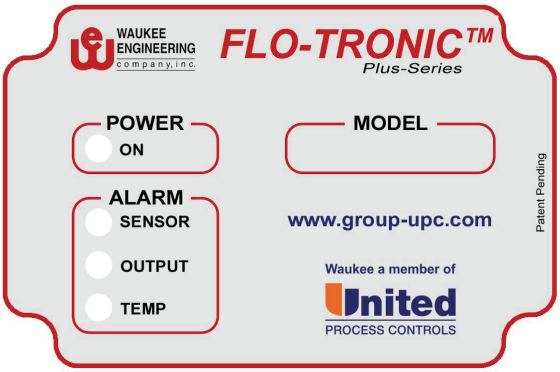
.5 x 1000 = 500CFH

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

10. TROUBLESHOOTING

Diagnostic Lights

The Flo-Tronic has a comprehensive diagnostic system. The diagnostic lights are displayed on the front panel of the unit.



PWR - The Power LED indicates when power is applied.

SEN - The Sensor LED indicates when Sensor Signal is Lost

OUT - The Output LED indicates when there is a problem with the output signal
Current mode = Output Open (No Load) or load resistance too high
Voltage mode = Output shorted or input resistance too low

TEMP - The TEMP LED indicates when unit electronics (IC) temperature is in excess of 185°F; unit will not function until temperature is below 185°F

Diagnostics	
Description	**Corrective Actions**
PWR LED not Illuminated	1. Check for 24VDC power at terminals 1 and 2 2. Make sure power supply is not over loaded
SENSOR LED Illuminated	1. Check wiring at terminals 1,2,3 of sensor TB 2. Check for cut or damaged sensor cable
OUTPUT LED Illuminated	1. Check wiring at terminals 3 & 4 2. Check wiring at Field device 3. Ensure unit is configured for correct output signal
TEMP LED Illuminated	1. Shield device from sources of heat

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

10. APPENDIX “A” - DRAWINGS

On Demand

Copyright © 2013, Waukee Engineering., a member of United Process Controls. All rights to copy, reproduce and transmit are reserved

Reach us at www.group-upc.com

United Process Controls brings together leading brands to the heat treating industry including Waukee Engineering, Furnace Control, Marathon Monitors and Process-Electronic.
We provide prime control solutions through our worldwide sales and services network with easy-to-access local support.

WAUKEE ENGINEERING COMPANY, INC.
A member of United Process Controls
5600 West Florist Avenue, Milwaukee, WI 53218, U.S.A.
Phone: +1-414-462-8200 Fax: +1-414-462-7022
E-mail: sales@waukeemeters.com

United PROCESS CONTROLS